

SEA LEVEL, THE VIEW FROM SPACE - AN OVERVIEW AND UPDATE

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Abstract: GLOSS Experts 7th Meeting and Related "Klaus Wyrtki Workshop" at the University of Hawaii, 23 to 27 April 2001

Those of us that were fortunate enough to attend the "Klaus Wyrtki Institute of Oceanography," were well-schooled in the importance of understanding the "great integrator" of all ocean measurements, sea level. As we ended the 20th Century, NASA recognized the important sea level research of Wyrtki and many others, and sponsored the visionary flight of the U.S./French TOPEX/Poseidon satellite altimetry mission. Flying flawlessly since August 1992, TOPEX/Poseidon data has truly revolutionized our understanding of the oceans and their impact on climate variability. Building on the research of two centuries of many, many scientists, TOPEX/Poseidon is providing quantum leaps forward in understanding of:

- Global ocean circulation
- Regional oceanography, Pacific, Indian, Atlantic & Southern Oceans
- Interannual climate variability, El Niño and La Niña
- Decadal climate variability, Pacific Decadal Oscillation, etc.
- Global ocean tide mapping & tidal dissipation
- Ocean & Climate Model data assimilation
- Mapping ocean bathymetry
- Many, many near-real-time operational applications

Recently, imagery from the U.S.-French TOPEX/Poseidon satellite show that La Niña's persistence may be part of a larger climate system. A giant horseshoe pattern of higher than normal sea-surface heights that began developing in early 1999 is dominating the entire western Pacific and Asiatic oceans. This pattern certainly resembles the characteristic horseshoe pattern of the Pacific Decadal Oscillation (PDO) - higher than normal sea-surface heights (warmer than normal sea surface temperatures) connecting the north, west and southern Pacific, contrasting with a cool wedge of lower than normal sea-surface heights (cooler than normal sea surface temperatures) off the coasts of the Americas and spreading into the eastern equatorial Pacific. This is a dramatic switch in the Pacific Ocean sea-surface height pattern of the past 20 years. Since 1976, the Pacific Ocean has been locked in a "warm phase" of the PDO - exhibiting a reversal of the present warm and cool regions; the horseshoe has been cool and the wedge warm. Since the PDO waxes and wanes approximately every 10 to 20 years, the emergence of this very strong pattern could indicate a "phase shift" in the PDO from the El Niño friendly "warm phase" of the past 20 years to a more La Niña friendly "cool phase" in the coming few decades.

Although it is too early to definitively label these changes in basin-wide conditions as a strong, multiple-year Pacific Decadal Oscillation "phase shift," the current TOPEX/Poseidon data suggest that simple labels or explanations such as a continuing La Niña/El Niño climate condition could be misleading. These interpretations have significant implications for our understanding of global climate.